Name:

at1117paper: Complete the Square (v320)

Example

A square's edge length is x feet. A rectangle has a height of x feet and a width of 38 feet. Their combined area, found by adding the square's area and the rectangle's area, is 423 square feet. What is the value of x?

Example's Solution

$$x^2 + 38x = 423$$

To complete the square, add $\left(\frac{38}{2}\right)^2 = 361$ to both sides.

$$x^2 + 38x + 361 = 784$$

Recognize the left side is now a perfect-square trinomial. Factor the left side.

$$(x + 19)^2 = 784$$

Undo the squaring.

$$x + 19 = \pm\sqrt{784}$$

$$x + 19 = \pm 28$$

Subtract 19 from both sides.

$$x = -19 \pm 28$$

In this geometric example, we are only concerned about the positive solution. So,

$$x = 9$$

Question 1

A square's edge length is x feet. A rectangle has a height of x feet and a width of 54 feet. The total area, of the square and rectangle, is 1575 square feet. What is the value of x?

$$x^2 + 54x = 1575$$

$$x^2 + 54x + 729 = 2304$$

$$(x + 27)^2 = 2304$$

$$x + 27 = \pm 48$$

$$x = 21$$

Question 2

A square's edge length is x feet. A rectangle has a height of x feet and a width of 52 feet. The total area, of the square and rectangle, is 1725 square feet. What is the value of x?

$$x^2 + 52x = 1725$$
$$x^2 + 52x + 676 = 2401$$
$$(x + 26)^2 = 2401$$
$$x + 26 = \pm 49$$
$$x = 23$$

Question 3

A square's edge length is x feet. A rectangle has a height of x feet and a width of 34 feet. The total area, of the square and rectangle, is 672 square feet. What is the value of x?

$$x^2 + 34x = 672$$
$$x^2 + 34x + 289 = 961$$
$$(x + 17)^2 = 961$$
$$x + 17 = \pm 31$$
$$x = 14$$